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## (54) EXCAVATING TOOL

(71) We, KENNAMETAL INC., a Corporation of The Commonwealth of Pennsylvania, United States of America, of One Lloyd Avenue, Latrobe, Pennsylvania 15650, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

The present invention relates to excavating tools, particularly in the form of bits, and is especially concerned with an improved arrangement for mounting gauge controlling inserts in a bit body and to the formation of the gauge controlling inserts.

Tools for drilling holes in earth formations are known and comprise steel bodies which are preferably provided with hard wear resistant inserts mounted in the working face of the bit body. Such hard wear resistant inserts include at least one row about the periphery of the working face serving as gauge inserts so that as drilling proceeds, the sides of the bit will not wear away rapidly and cause a hole to be tapered. A tapered hole is particularly disadvantageous because if a bit becomes worn it must be removed from a hole and replaced by another, a tapered hole can create problems because a new full size bit will be likely to wedge in the tapered hole.

The inserts mounted in the working face of the bit are extremely hard and wear resistant, generally being formed of a cemented tungsten carbide material, and will wear away only slowly, so that the guage inserts provided tend to maintain the gauge of a hole being drilled for a substantial period of time.

It has been found, however, that the gauge inserts will sometimes wear off more rapidly than is desired, particularly when hard formations are encountered so that even with hard wear resistant gauge inserts the bit may wear away somewhat more rapidly than desired and produce a tapered hole.

The principal object of the present invention is the provision of special gauge inserts mounted in the side of a bit body of a mining bit which present upwardly and downwardly facing sharp edges so that the added inserts can assist in cutting operations and can also serve to assist in breaking up overburden which may collapse on top of the bit during drilling operations.

The present invention will now be more particularly described with reference to the accompanying drawings, in which: —

Figure 1 is a side view of a typical bit according to the present invention;

Figure 2 is a fragmentary vertical sectional view indicated by line II-II on Figure 1 and drawn at enlarged scale.

Figure 3 is a view looking in from the side of Figure 2 as indicated by arrow 3 thereon.

Figure 4 is a perspective view showing a typical further insert.

Accordingly, the present invention consists in a mining bit having a bit body with a working face at the front end and a peripheral wall extending rearwardly from said working face, said working face being generally planar and perpendicular to the longitudinal axis of the bit body; inserts mounted in the front end of said body and distributed over said working face and protruding axially therefrom; at least one row of gauge inserts mounted in the front end of said body near the juncture of said working face and said peripheral wall and protruding angularly from the body so as to protrude radially outwardly beyond said peripheral wall and axially outwardly beyond said front end; and at least one row of further inserts of which each further insert is so mounted in said body as to extend radially into the peripheral wall of said

body and to be circumferentially spaced from the next adjacent ones in said row and to be spaced axially along said peripheral wall from said gauge inserts; each of said further inserts protruding radially from said peripheral wall substantially the same distance as each of said gauge inserts and the radially outer end of each of said further inserts being rectangular in cross-section with a diagonal of the rectangle disposed in a plane which contains the longitudinal axis of the bit body; all of said inserts and said gauge inserts and said further inserts being formed of a hard wear-resistant material. It will be evident that the axially facing sides or corners of the rectangular-section inserts constitute useful sharp edges.

Preferably, one of said further inserts is disposed in each sectional plane of the bit body which contains not only said longitudinal axis but also a gauge insert, whereby each gauge insert is in axial alignment with a further insert.

The radially outer end of each of said further inserts may be disposed radially inwardly from the cylindrical envelope which contains the radially outermost points on said gauge inserts a short distance of not more than 0.010 inches.

There may also be an additional row of said further inserts axially displaced along said peripheral wall from said one row of further inserts, the further inserts in said additional row being circumferentially staggered relative to the said further inserts of said one row thereof.

The said hard wear-resistant material preferably comprises cemented tungsten carbide.

Referring to the drawings somewhat more in detail, the bit body is designated at 10 and has one end 12 adapted for connection to a driving instrumentality while the other end 14, and which may be considered the front end, forms a working face which is generally planar and perpendicular to the longitudinal axis of the bit body. The bit body comprises a peripheral wall 16 extending rearwardly from front end 14 and advantageously tapering inwardly slightly in the rearward direction.

Rearwardly of peripheral wall 16, the bit body reduces in diameter for the flow of reduced material backwardly along the bit body and the bit body may, furthermore, be provided with axial flutes 18 for the flow of reduced material taken by the bit.

The front working end of body 10 is provided with a plurality of axial holes 20 in which are mounted rod-like inserts 22 having domed outer ends 24 which protrude axially outwardly from working face 14. Inserts 22 may be press fitted in bores 20 or may be otherwise affixed therein, as by brazing. The inserts 22 are distributed radially and circumferentially over face 14 and thereby reduce a formation against which the bit is impacted.

Near the juncture of peripheral wall 16 with forward end 14 of the bit body, there are provided axially inclined bores 26 in which are mounted inserts 28 which also have domed outer ends 30. Inserts 28 may be indentical with inserts 22 if desired.

It will be seen in the drawings, particularly in Figure 2, that the other ends of inserts 28 not only protrude axially from front end 14 of the bit body, but also protrude radially as well. Inserts 28, which are distributed about the circumference of the bit body, thus, serve as gauge inserts and tend to maintain the size of the hole being drilled by the bit substantially constant.

This is important because, if the bits wear in the circumferential direction as drilling proceeds, the hole formed by the bit will be tapered, and it will not be possible to introduce a new bit into the hole. The gauge inserts, thus, have an extremely important function to carry out during the operation of the bit.

According to the present invention, the holding of the gauge of a hole being drilled is enhanced by the provision of at least one row of further inserts, indicated at 32 and extending radially into the periphery of bit body 10 within the range of peripheral wall 16 and spaced axially rearwardly from the forward end 14 of the bit body. The inserts are distributed circumferentially about the body and, as will be seen in Figure 3, each gauge insert 28 preferably has a respective further insert 32 in axial alignment therewith.

Inserts 32 protrude radially from peripheral wall 16 about the same distance as the gauge inserts 28 although, advantageously, the radial outer ends of inserts 32 may be set back a distance of up to about .010 inches from the cylindrical envelope in which the radially outermost regions of inserts 28 are disposed.

Still further, the radially outwardly protruding ends of inserts 32 are preferably formed square, as indicated at 34, and when the inserts 32 are installed in body 10, the diagonals of the squared outer ends thereof are arranged vertically and horizontally, respectively.

Each of the inserts 34 is, thus, formed with axial cutting edges, one of which faces vertically upwardly and the other of which faces vertically downwardly. Especially by virtue of the aforementioned axial cutting edges, the inserts 32 can take part in the cutting action, particularly where it is necessary to remove material from the hole being drilled to maintain the gauge.

Still further, in the event that material collapses in the hole upwardly of the bit,

thereby placing an overburden on the bit, at least the axially upwardly facing sharp cutting edges referred to assist materially in the extraction of the bit from the hole being drilled.

As will be seen in Figure 1, in addition to the row of inserts 32, an additional row of further inserts 38 can be provided protruding radially from the peripheral wall 16 about the same distance as inserts 32 and also being formed with square ends thereon. The inserts in said additional row are circumferentially distributed about the bit body and preferably are staggered relative to the inserts 32.

The inserts 38, which may be identical with inserts 32 in respect of size and radial protrusion measured from the axis of the bit body, the disposition of the diagonals of the squared ends thereof serve the same function as inserts 32 with respect to assisting in holding the gauge of the hole being drilled and with respect to assisting in extracting the bit from overburden which may collapse thereon.

Where only a single row of the further inserts is provided, it is advantageous to align the further inserts with the guage inserts as shown in Figure 3 so that the guage of the hole being drilled will be accurately maintained for a prolonged period of time.

WHAT WE CLAIM IS: —

1. A mining bit having a bit body with a working face at the front end and a peripheral wall extending rearwardly from said working face, said working face being generally planar and perpendicular to the longitudinal axis of the bit body; inserts mounted in the front end of said body and distributed over said working face and protruding axially therefrom; at least one row of gauge inserts mounted in the front end of said body near the juncture of said working face and said peripheral wall and protruding angularly from the body so as to protrude radially outwardly beyond said peripheral wall and axially outwardly beyond said front end; and at least one row of further inserts of which each further insert is so mounted in said body as to extend radially into the peripheral wall of said body and to be circumferentially spaced from the next adjacent ones in said row and to be spaced axially along said peripheral wall from said gauge inserts; each of said further inserts protruding radially from said peripheral wall substantially the same distance as each of said gauge inserts and the radially outer end of each of said further inserts being rectangular in cross-section with a diagonal of the rectangle disposed in a plane which contains the longitudinal axis of the bit body; all of said inserts and said gauge inserts and said further inserts being formed of a hard wear-resistant material.

2. A mining bit according to Claim 1, in which one of said further inserts is disposed in each sectional plane of the bit body which contains not only said longitudinal axis but also a gauge insert, whereby each gauge insert is in axial alignment with a further insert.

3. A mining bit according to Claim 1 or Claim 2, in which the radially outer end of each of said further inserts is disposed radially inwardly from the cylindrical envelope which contains the radially outermost points on said gauge inserts a short distance of not more than 0.010 inches.

4. A mining bit according to any one of Claims 1 to 3, in which there is an additional row of said further inserts axially displaced along said peripheral wall from said one row of further inserts, the further inserts in said additional row being circumferentially staggered relative to the said further inserts of said one row thereof.

5. A mining bit according to any one of the preceding Claims, in which said hard wear-resistant material comprises cemented tungsten carbide.

6. A mining bit as claimed in any one of the preceding Claims in which the radially outer ends of the further inserts are of square cross-section.

7. A mining bit constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

For the Applicants:
G. F. REDFERN & CO.,
St. Martin's House,
177 Preston Road,
Brighton, West Sussex,
BN1 6BB
and
24 High Street,
Kidderminster,
Worcestershire,
DY10 2DJ.

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1443092 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG-1

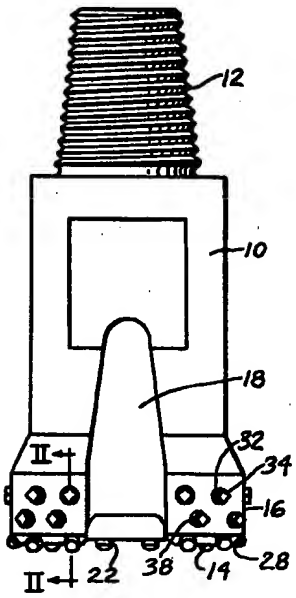


FIG-2

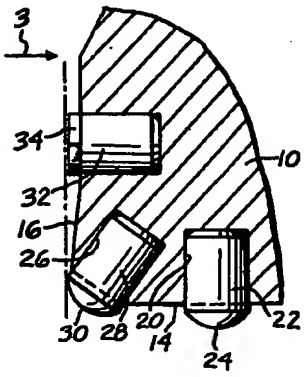


FIG-3

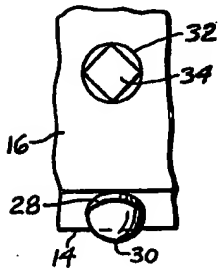


FIG-4